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# United States Patent [19]

Finman

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[54] **ADAPTIVE CONTROL ELECTROMAGNETIC SIGNAL ANALYZER**

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[52] **U.S. Cl.** ..... **364/578**; 333/103; 364/481

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[57] **ABSTRACT**

An electromagnetic signal analyzer is disclosed which measures a signal from a test path and a signal from an adaptively controlled reference path. Specially biased semiconductor junctions function simultaneously as electromagnetic signal attenuators, electromagnetic signal detectors, and parametric frequency converters, thereby providing unique advantages for system calibration. Adaptive modeling of the measured response to control changes gives a measure of test path and signal characteristics and also provides a prediction of the measured response for both a change in the controls and a change of the input signal. A precision complex phasor modulator serves as an important building block for measurement and control of amplitude-modulated and frequency-hopping electromagnetic signals. Specific configurations of a disclosed generic electromagnetic signal analyzer include: (1) an instantaneous frequency and amplitude detector, (2) a vector Automatic Network Analyzer (ANA) for measurement of amplitude and phase characteristics of a device under test versus frequency, (3) a vector spectrum analyzer for measurement of the amplitude and phase versus frequency of an electromagnetic signal, and (4) an Adaptive Predictor Interference Canceler for Interference suppression in a fast frequency-hopping communication system.

**15 Claims, 21 Drawing Sheets**